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APPLICATION NOTE

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CRT Screen Refresh with EPROMs

John F. Rizzo
SPD Applications Engineering

INTRODUCTION

Displaying information on cathode ray tubes can considerably reduce a microprocessor's throughput and efficiency. This burden can be minimized by assigning dedicated hardware to refreshing screen characters that do not vary over time. In this particular application EPROMs lend themselves nicely since their data can be changed to suit a wide range of applications. The system described here is ideally suited to displays where a small proportion of the screen undergoes change. Monitors on which forms, ledgers, and games are displayed can benefit from such a scheme.

CIRCUIT DESCRIPTION

The accompanying block diagrams detail the circuit implementation. Within the system are buffer RAM, EPROM and PROM. These devices contain information that corresponds to the vertical (Y) screen deflection. RAM is used to store constantly varying quantities, EPROM for non-varying background, and PROM for graphic symbols or system attributes. The horizontal (X) deflection is controlled by a digital to analog converter which obtains its input from a 10 bit counter. See Figure 1.

This 10 bit counter is a subset (Most Significant bits) of a larger 13 bit counter; the remaining 3 least significant bits select which of the memory devices provides data for the Y deflection. Logic circuitry interfaces to the microprocessor and operates the gating and memory control signals. When the processor is not accessing the CRT refresh system, the clock is gated to the 13 bit counter. This counter scans each of the memory devices and then switches to the next horizontal position.

The process continues across the entire screen. The microprocessor can alter the RAM contents by accessing the control logic and loading an address into the presettable counter; data can be loaded in a similar manner through the system buffer. An analog to digital converter is provided to allow direct analog interface to the CRT while the microprocessor is not accessing the refresh system.

This analog input is particularly useful in applications where signals need to be stored over time. Digital storage oscilloscopes use a similar means to capture analog data and preserve it in a digital memory. When

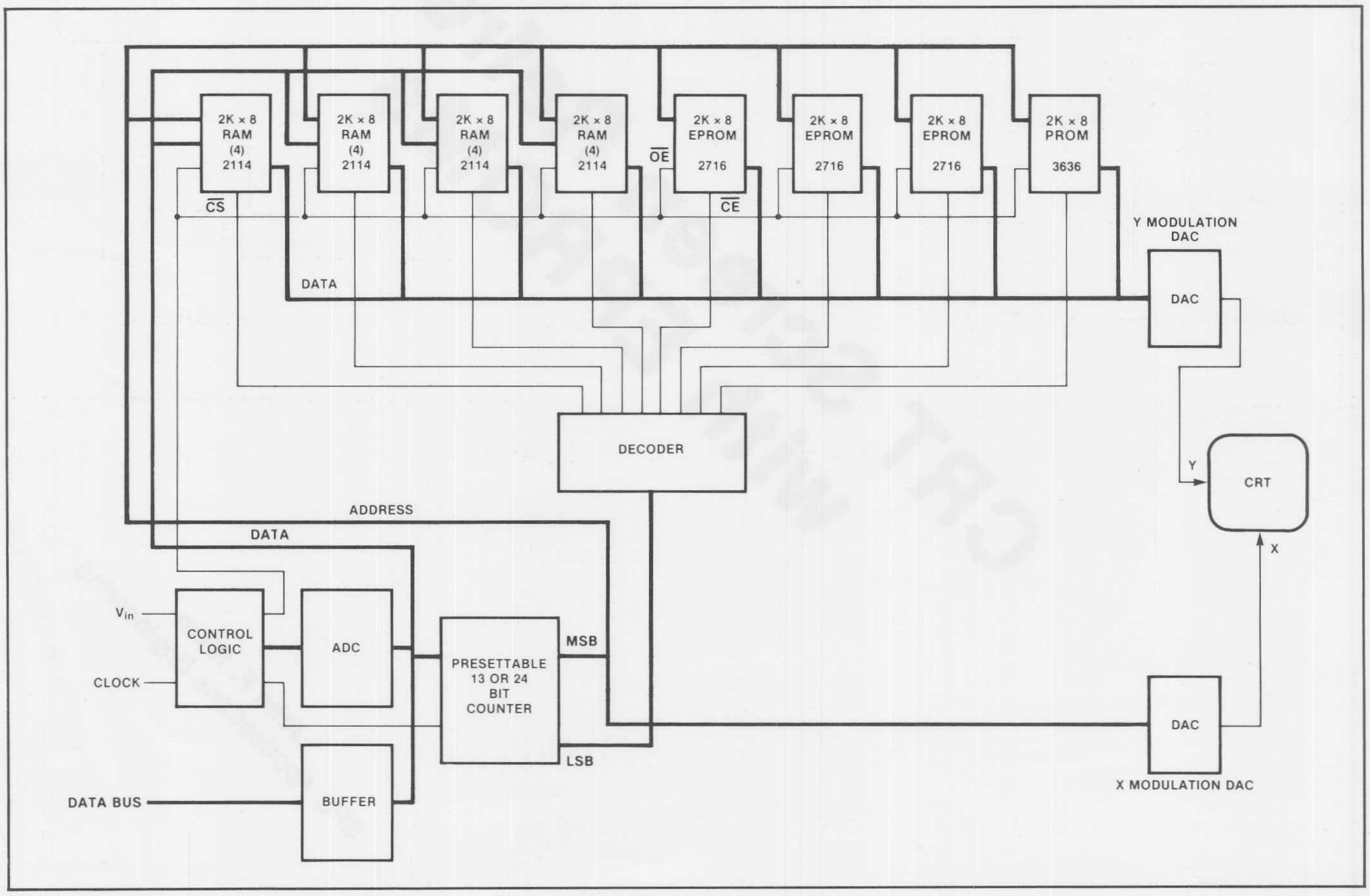

Figure 1. XY Modulation System

the system is in the store mode RAM data continually updates the display and the analog input circuit is disabled. In the display mode the digital conversion of the analog signal is stored in RAM as it is displayed. In this case a four channel display is possible. Additional triggering circuitry could be used to display certain portions of the stored waveform as well as adjusting the horizontal scan rate to emulate a conventional oscilloscope. The EPROM memory would store horizontal and vertical axis and timing marks, the PROM containing sweep rate characters or other numerical information.

Figure 2 is the block diagram for an intensity modulated scheme. In this case the address counter size is increased to 24 bits. The least significant bits select the individual memory devices as before, except instead of providing Y deflection the memory data causes intensity modulation. Horizontal scanning is provided through the upper counter bits as in the previous implementation; remaining bits address each memory location before switching to the next horizontal position. The entire display is then a field of varying intensity, much like a television screen.

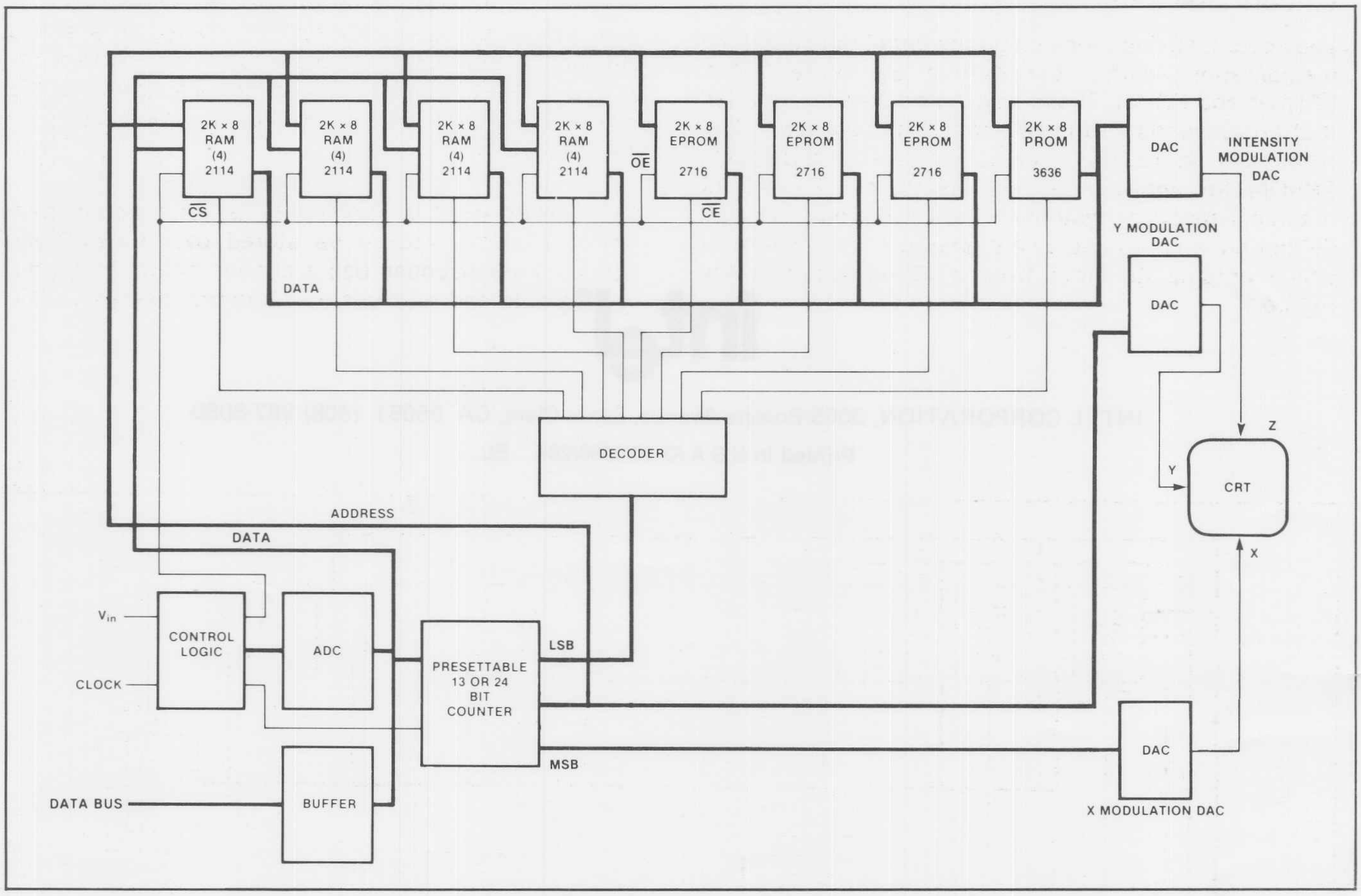

Figure 2. XYZ Modulation System

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